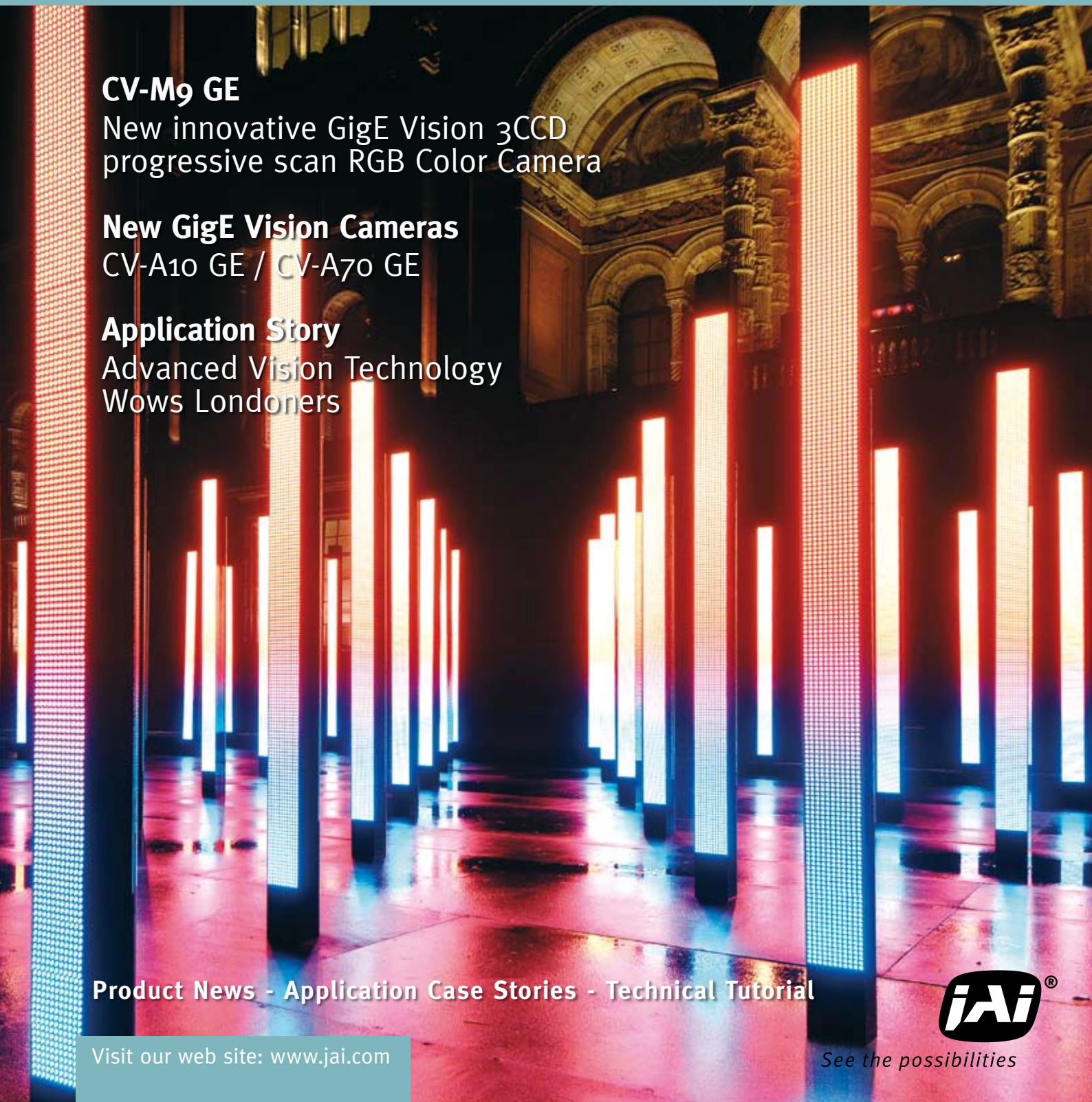
JAI vision

1. edition 2007

CAMERA NEWS



CV-M9 GE
New innovative GigE Vision 3CCD progressive scan RGB Color Camera

New GigE Vision Cameras
CV-A10 GE / CV-A70 GE

Application Story
Advanced Vision Technology Wows Londoners

Product News - Application Case Stories - Technical Tutorial

Visit our web site: www.jai.com

See the possibilities

JAI UPDATE

"WHERE CAMERAS ARE A PASSION"

Welcome to the spring edition of JAI Vision Camera News, which features a range of important product launches and application stories from JAI.

By now practically everyone knows about Gigabit Ethernet for machine vision and industrial imaging – and credit has to be given to the Automated Imaging Association (AIA) and key industrial players in establishing a coherent standard for finally getting the camera on the network. The standard provides safe transmission of high data rates, including simplification of connectivity and affordability in building vision applications.

JAI has supported and embraced this technological evolution right from the start, and we intend to stay at the forefront of our industry. As you can read in this edition – we are introducing more new hardware with additional features around this new important standard. The way forward for JAI continues to be strict focus on customer needs and new product development.

Also in this edition of JAI Vision: – JAI camera technology wows Londoners, news on JAI corporate branding, new applications with GigE networking, channel update for the US market and new features in the dual-tap cameras.

Given a maybe mixed weather outlook and significant changes to the vision market – we continue to meet new opportunities in all regions - with Asia being the most vibrant.

We hope you continue to enjoy the magazine – every step we take is headed towards more value for our customers.

Please feel free to give us your comments and feedback.

Henrik Ilsby
Senior VP, JAI Camera Solutions

UPCOMING IMAGING EVENTS 2007

- **June 6 - 8, 2007**
  Exhibition on Sensing via
  Image Information
  Yokohama, Japan
  www.seiki-tsushin.com/sensing/eng/
  JAI Camera Solutions

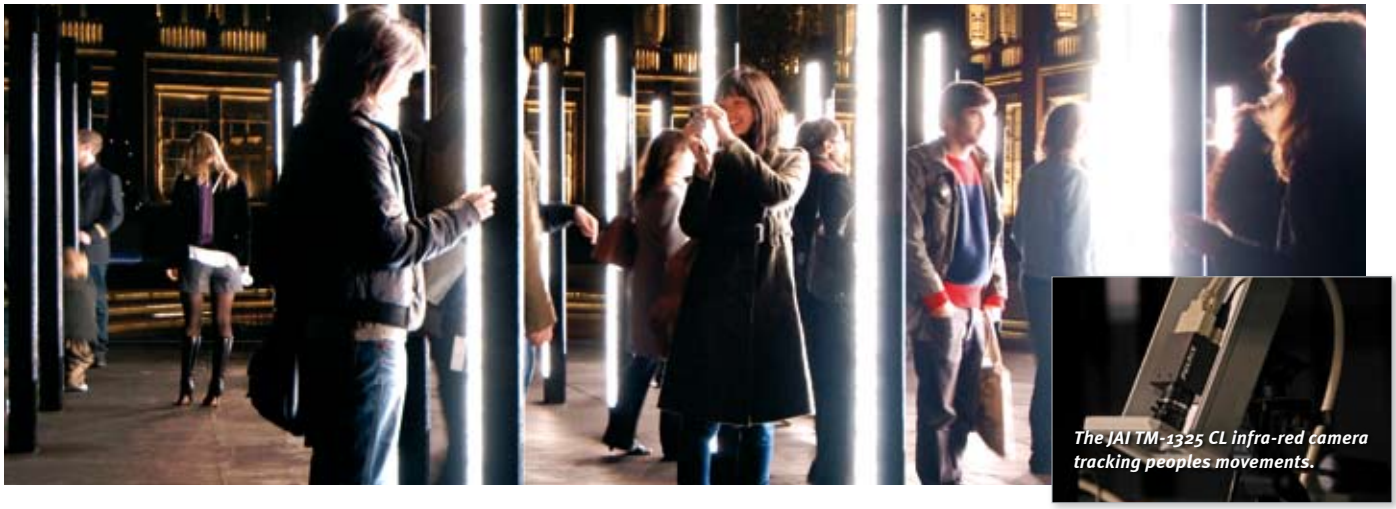
- **June 12 - 14, 2007**
  Robots & Vision 2007
  Rosemont, Chicago, IL, USA
  www.robots-vision-show.info
  JAI Camera Solutions

- **June 15 – 16, 2007**
  5th European Machine Vision Business Conference
  Lyon, France
  www.emva.org
  JAI Camera Solutions

- **November 6 – 8, 2007**
  Vision 2007
  www.vision-messe.de
  Stuttgart, Germany
  JAI Camera Solutions

APPLICATION CASE STORY

Advanced vision technology wows Londoners



The JAI TM-1325 CL infra-red camera tracking peoples movements.

"This is absolutely stunning. Kudos to the designers," said one. "WOW, this deserves to be permanent" said another. The object of their admiration was 'Volume', a luminous interactive installation which attracted Londoners in their thousands to the John Madejski Garden of the V&A Museum in South Kensington from November 2006 to January 2007.

Brilliant display

'Volume' was the result of a collaboration between London-based lighting designers United Visual Artists and Robert Del Naja of Massive Attack and his co-writer Neil Davidge (as part of their music production company, one point six). The walk-in installation featured an array of light columns that responded spectacularly to human movement, triggering a brilliant display of light and sound.

Visitors curious to know how their motion was being detected would probably have noticed a row of infra-red illuminators mounted on a first floor balcony, but what was really tracking their movement was sitting in the shadows of an alcove above - a JAI TM-1325 CL camera, supplied by JAI's UK distributor Firstsight Vision, which is UK & Ireland's largest independent supplier of machine vision components including cameras, optics, interfaces, software and smart systems.

Ideal solution

Firstsight Vision's Business Development Manager Alastair Slater describes why the camera provided an ideal solution for the 'Volume' installation: "The system was designed to work by reflecting near infra-red light from the scene to a suitably sensitive camera with sufficient resolution and frame rate. The JAI TM-1325 CL is a 1.45 megapixel camera with enhanced near IR response and a frame rate of 30 Hz, so it was more than up to the job."

For the installation, the camera was equipped with a filter to block all ambient illumination. Since the light columns were static, the only variation in light reflection would come from people moving on the scene. The signal from the camera could then be processed to detect the location of movement and trigger the emission of light and sound from each column in relation to the proximity of movement. 'Volume' used components from the Common Vision Blox image processing library, for which Firstsight Vision is also the UK supplier.

Alastair Slater concedes that camera applications of this type are limited, but he acknowledges that they certainly provide a colorful and entertaining means of demonstrating what cameras like the JAI TM-1325 CL can do.

FAQ's - GigE Vision Standard Interface

Question	Answer
What is the maximum cable length of a Gigabit Ethernet connection?	Cable lengths of up to 100 meters are possible. Longer distances can be bridged using switches or routers.
What type of cable is required for GigE Vision cameras?	Cat5e can be used, but Cat 6 is recommended
How can I avoid trigger latency with GigE Vision cameras	All JAI GigE Vision cameras accept a hardware trigger (in the 12-pin Hirose connector), providing no-delay triggering.
How many cameras can I connect to one GigE Vision host.	In theory, GigE Vision allows an infinite number of cameras to be connected. In practice, however, the number of cameras depends on the transmission rate (MByte/sec) being sent from each camera; Image resolution x frame rate = transmission rate. The maximum transmission bandwidth is 110 Mbyte/sec.
Which Gigabit Ethernet devices can I use together with the GigE Vision cameras?	All network switches designed for Gigabit Ethernet can be used. When using Jumbo packets, make sure to use a switch that can handle more than 1.5kB packets
What is a Jumbo packet?	An Ethernet data packet larger than 1440 kBytes is loosely referred to as a Jumbo packet. Using Jumbo packets improves the transmission throughput, as the overhead (packet headers) is reduced.
Does JAI provide software with the cameras?	Yes, JAI provides the necessary drivers and other DLL files for WinXP. There also an SDK (Software Developent Kit) for the cameras, allowing the system engineer to easily integrate the cameras in the application.
What is GenICam?	GenICam is a standard associated with the GigE Vision standard, defining a generic interface for controlling cameras in conjunction with an XML file
What is an XML file?	It is a standard file format used to describe the functions available to a particular camera. The XML file resides in the camera and is downloaded to the Host when the camera is connected. The host software is then automatically configured with the functions (and range of settings of the functions) for precisely this camera.

Application

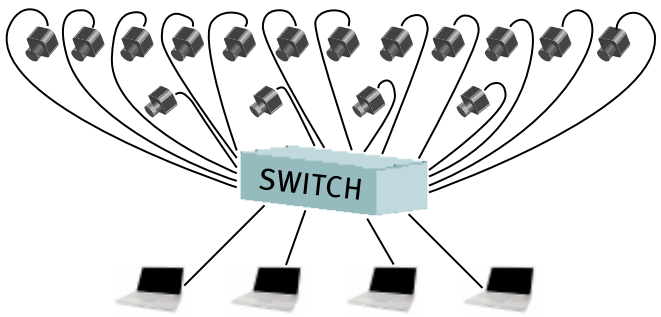
New applications with GigE Vision networking

An increasing number of JAI's customers with knowledge of network topology are now using and evaluating JAI's GigE Vision cameras, in a range of new types of imaging applications. Many of these new applications have not been possible before, at least not at an acceptable price level.

Concrete crack propagation

One application example can be found in the field of stress testing of building elements where there is a need to monitor structural crack propagation as real life building elements are disintegrated under controlled pressure. As the building elements under test have a significant size, it would require multiple cameras set up in a network configuration.

This could be a set-up of between 15 and 20 cameras around a full size concrete dome structure with the aim of mapping and documenting a stress test from all angles of the dome structure just before and during the collapse. Using a star network topology configuration with cables up to 100 meters long, it is possible in this example to use 4 PCs each getting 12 synchronized frames per second from multiple 1920 x 1080 pixel cameras.



Example of star network topology

Frame buffering

JAI's GigE Vision cameras feature built-in frame buffers where image frames can be stored until the application software is ready to retrieve them. This feature is especially useful in applications where there is a need to capture a large amount of images from multiple cameras in a network during a very short time frame.

An application example could be capturing images of train wheels in motion as the trains pass by at full speed. The images are captured almost simultaneously and stored in the camera buffer. When the train has passed, the images are transferred from the camera buffer to the application software at the speed the software is ready to retrieve them. This scenario would only require a single computer.

Round-robin technique for heavy image processing

High-end surveillance

Another example where JAI's GigE Vision camera technology is ideal in Ethernet configurations is in high-end surveillance systems e.g. airport security systems. One operator would be able to monitor 12 XGA or 30 VGA cameras at 10 fps simultaneously from the same network string while another security operator in a completely different location at the airport, would be able to monitor the same cameras at the same time, or even a completely different set of cameras. Applying Ethernet network configuration together with JAI's high resolution cameras provides maximum flexibility in any kind of high-end surveillance application.

Heavy image processing

In cases where heavy image processing is needed, multiple processors can be put to work using a round-robin technique. Using JAI GigE Vision cameras in networks is opening up for a range of new and advanced imaging applications. If you would like to discuss these new exciting possibilities, please contact JAI or your local JAI distribution partner.

New innovative 3CCD progressive scan RGB color camera featuring GigE Vision interface

JAI introduces the CV-M9GE - a new innovative digital 3CCD industrial progressive scan RGB color camera. With the CV-M9 GE, machine vision integrators and machine vision users for the first time have access to an industrial camera that combines advanced 3CCD RGB color vision technology with the easy-to-use GigE Vision standard interface.

CV-M9 GE - The first 3CCD camera with GigE Vision interface

The design of the CV-M9 GE is based on JAI's popular and proven 3CCD CV-M9 CL camera which is widely used in demanding machine vision applications across a diverse range of industries. The CV-M9 GE is suitable for use in semiconductor production, food sorting, print inspection and flat panel quality verification, as well as in medical devices for patient diagnostics.

CV-M9 GE highlights

- 3CCD progressive scan
- GigE Vision interface
- 1024 x 768 pixels per color
- 30 frames/second
- Programmable GPIO

The GigE Vision standard interface, together with programmable GPIO (General Purpose Input/Output) ports used in the CV-M9 GE, takes the trouble out of integrating advanced 3CCD prism color technology into even the most demanding imaging applications.

GigE Vision cameras use standard Cat5e or Cat6 cabling and do not require a dedicated frame grabber in the PC. This translates directly into cost savings and shorter "time-to-market" when developing advanced machine vision inspection systems.

Based on 3CCD prism technology, the CV-M9 GE provides full XGA 1024 x 768) resolution for each of the Red, Green and Blue color bands. The camera features both manual and automatic one-push white balance adjustment, making it easy to achieve the correct setting for a wide range of color temperatures and under difficult lighting conditions. Alternatively the white balance can be adjusted by individual shutter settings in the Red, Green and Blue channels, while maintaining a consistent and high signal/noise ratio in each channel.

The CV-M9 GE can be operated in continuous (free-run) mode at 30 frames/second or in external trigger mode. The Edge Pre-Select trigger mode uses a pre-defined exposure time whereas the Pulse Width Control trigger mode sets the exposure time based on the width of the trigger pulse.

The CV-M9 GE also features a sequencer trigger mode that permits on-the-fly change of a combination of gain, offset and Region of Interest (ROI). Another useful function is "delayed readout" where images from simultaneously triggered cameras are read out in sequence to avoid congestion on the Ethernet interface.

3CCD color cameras now as easy as ABC (...or RGB)!

GigE Vision simplifies interfacing advanced color cameras

PRODUCT NEWS

CV-A10GE / CV-A70GE – new GigE Vision cameras

Making use of well proven circuit designs, and at the same time driven by the ambition to continuously improve performance and user friendliness, has been the recipe for success of a large number of JAI's products through the years.

Based on the successful CV-A10CL and CV-A70CL cameras, the new GigE Vision cameras CV-A10GE and CV-A70GE have been created in the same spirit of providing the highest image quality, augmented by the easy to use, flexible GigE Vision interface.

CV-A10GE / CV-A70GE – new GigE Vision cameras

The monochrome CV-A10GE boasts 60 full frames/second at SVGA resolution (767 x 576 active pixels, to be exact), while maintaining a signal-to-noise ratio in excess of 55 dB. Partial scan and vertical binning provide up to 250 frames/second with reduced vertical resolution. The 1/2" format progressive scan sensor has 8.4 x 8.4 µm pixels with microlenses.

The Bayer mosaic color version, CV-A70GE, shares the same functionality and performance as the monochrome camera, with the exception of vertical binning.

Both cameras have the GigE Vision standard interface, and comply with the Gen‹i›Cam standard for configuration and control though the embedded XML file.

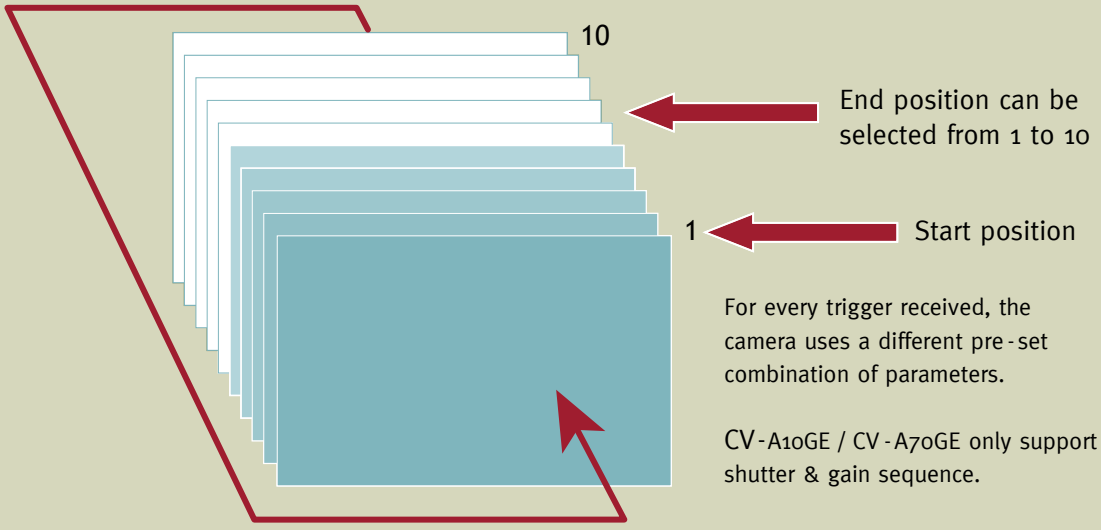
This guarantees easy interfacing to 3rd party software libraries, like Common Vision Blox (Stemmer Imaging), LabView (National Instruments) and MIL (Matrox). In order to optimize streaming of images from the camera to the PC, the packet size and inter-packet delay can be adjusted.

The CV-A10GE and CV-A70GE are both supported by the JAI SDK (Software Development Kit) Light, giving system design engineers an effective tool for integrating these cameras with their own system software and hardware.

The JAI GigE Vision cameras also introduce a number of new functions:

- Programmable GPIO - user definable Inputs/Outputs with multiple timers & counters
- Sequence trigger - allows on-the-fly change of shutter & gain settings in a sequence of up to 10 events
- Delayed readout trigger - keeps an image resulting from a triggered event in memory, until released by a software trigger

1 to 65535 repetitions possible



For every trigger received, the camera uses a different pre-set combination of parameters.

CV-A10GE / CV-A70GE only support shutter & gain sequence.

New features in DUAL-TAP Cameras

With the latest update of the TM-4100 dual-tap camera to TM-4200, JAI has now met customer requests for a 12-bit camera front-end. But there is more to the story... because what seems like a small change from the outside is in fact a completely new camera with new electronics and a range of additional functions – and at the same time the TM-4200 is a drop-in replacement for the TM-4100. This new platform is also the basis for the brand new 2 megapixel cameras, TM-2040 and TM-2030. All of these models are available in monochrome and color versions and can be ordered with Camera Link or GigE Vision interface.

TM-4200 Series

The new analog 12-bit front-end features:

- S/N ratio greater than 58 dB – an improvement of several dB.
- Image output is user selectable between 12, 10 or 8-bit (10-bit and 8-bit with the built-in LUT).
- Single-tap and dual-tap operation is software selectable. For dual-tap output the manual and automatic channel balancing is significantly improved.
- Programmable partial scan.
- Blemish compensation.
- PIV modes are incorporated.
- Resolution Proportional Digital Zoom (RPDZ) Feature

And there are many other new features, such as 2 by 2 binning, adjustable back focus and full analog output. For further information please see the camera data sheets and manuals available at www.jai.com

Programmable partial scan

This new functionality is of interest for capturing images of elongated objects. It allows the user to adjust the starting position and number of lines to capture - on the fly - making it possible to track an object. At the same time the frame rate is increased. Sending the partial scan command (position: XXXX, height: YYYY) to the camera during or just after image capture, the camera will use these settings for the next capture.

Blemish compensation

With time CCD imagers will begin to show blemishes. A blemish is a pixel showing a significantly higher or lower value compared to the average pixel value of all the pixels (see fig.1). For various applications such a blemish can be mistaken for a surface artifact, contamination or glare and requiring additional image processing to remove this effect.
The blemish compensation method used in the cameras is based on a nearest neighbor interpolation and works for monochrome and color sensors (see fig.2). Since the blemish compensation only concerns pixel positions, it is independent of all subsequent gain and shutter settings. The function compensates up to 256 pixel values and is easy to use with the simple built-in calibration procedure.

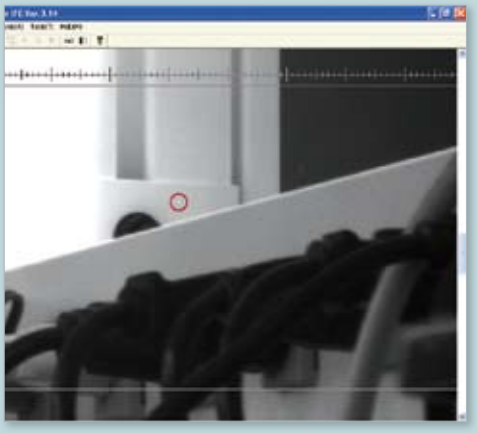


Figure 1: Blemish

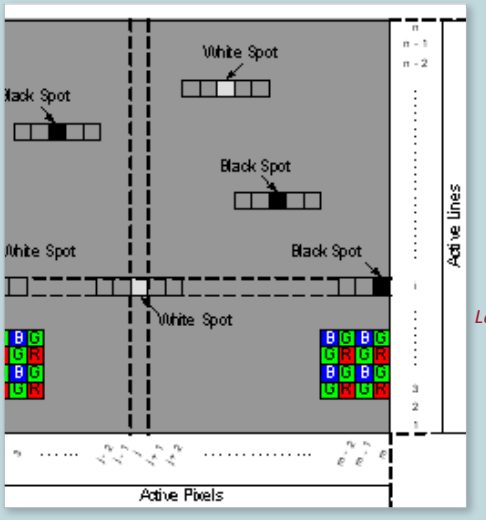


Figure 2: blemish interpolation.

Layout picture

Resolution proportional digital zoom (RPDZ)

This patent pending technology is available on new 4 megapixel camera models (TM-4200CL and TM-4200GE). RPDZ maintains a constant data rate between the camera and the host computer while digitally modifying (zooming) the camera's field-of-view (FOV). This is accomplished by sub-sampling pixels in the image in a manner proportional to the digital zoom level. For example, in a 4 megapixel camera (2048 x 2048) utilizing RPDZ, four zoom modes are offered. The full FOV is imaged by capturing every fourth pixel in every fourth row, thus creating a 512 x 512 resolution. (See fig 3).

As the image is digitally zoomed through the other three modes, the sub-sampling rate is adjusted to maintain the same pixel density until it reaches the center 512 x 512 pixels of the image. The idea is to support digital zooming in applications like UAVs, while holding the resolution at a level that fits within the standard TV bandwidth of a real-time RF link.

It can also be used in multi-camera network scenarios where digital zooming is required but network bandwidth is limited.

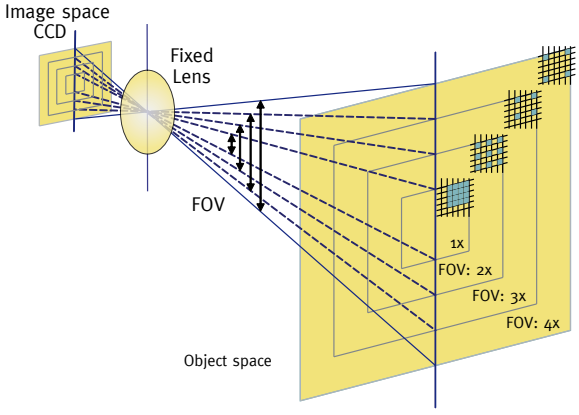


Figure 3: Variable Field Of View (FOV) by Sub-sampling
Fixed image format 512x512 pixels

PIV modes

Two double exposure modes used for PIV (Particle Image Velocimetry) – a fluid mechanical measurement technique - are implemented. The idea is to have two separated full frame images with a short interframing time.

After the acquisition the two images are divided into sub-areas and cross-correlated, giving the direction and speed of the flow of interest for many points in space.

The first image is acquired and transferred into the inter-line registers in response to the trigger.

The second image is stored in the photosites and must wait for the first image to be read out before it can be transferred and read out (see fig.4). The typical light sources for PIV are Q-switched lasers or flashes with short light pulses, freezing most movements.

The short and well defined light pulses make it possible to place a light pulse on each side of the sensor gate pulse – the strobe blanking period is 20 clk or 500 ns. The exposure time of the first image is either fixed (mode 1) or trigger controlled (mode 2).

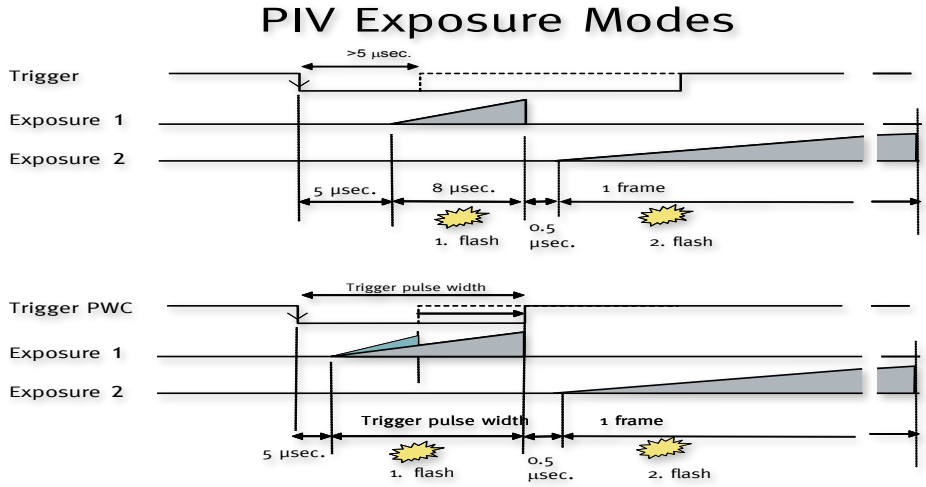


Figure 4: PIV exposure modes

Making a name in America - JAI Pulnix becomes JAI Inc.

On 1 January 2007, JAI's North American subsidiary, JAI Pulnix, took a small but meaningful step as it officially changed its name to JAI, Inc. This change was implemented to help simplify the way the company communicates to its customers and prospects on a worldwide basis.

It also reflects the continued merging of the JAI and Pulnix product lines into a single comprehensive offering of high performance camera solutions.

Although the name of the U.S. subsidiary has been changed, the mission remains the same. Our San Jose, California facility will continue to design, manufacture, sell and support the high fidelity, leading edge capabilities that customers around the world have come to expect from both the JAI and the Pulnix product families.

Of course, the Pulnix name will not disappear completely. For the next few years, cameras carrying the Pulnix label will continue to be produced by the U.S. facility as it supports the large number of successful installations for these products around the world.

All new designs, however, whether produced in San Jose or in our engineering and manufacturing facilities in Japan, will now be delivered exclusively under the JAI label.

The name change in San Jose continues the branding process that was launched by the company in late 2006 (see JAI Vision 2006, edition 2).

With all worldwide operations now under the JAI banner, the company can much more easily present a unified appearance and more consistent messaging. The goal is simple: to make sure that companies looking for the best in high performance cameras need only remember a single name – JAI.

JAI's new office buildings in San Jose, Silicon valley, California.

New name, new distributors

Along with the new name, JAI's U.S. subsidiary also unveiled a new two-tiered distribution structure for the Americas, and announced agreements with three companies to serve as top-tier "Channel Distributors" in the new structure.

The three channel distributors are Nu Horizons, with 29 sales offices covering the U.S., Canada, and Mexico; Integrys Limited, with five offices devoted exclusively to the Canadian market; and 1stVision, with three sales offices and a territory spanning the U.S. and Eastern Canada.

These three Channel Distributors are also affiliated with a network of more than a dozen value-added resellers (VARs) and system integrators (SIs) providing specialized sales, support, and custom solution development to customers throughout North America.

Sales and support of JAI cameras in Central and South America continue to be handled by Altec Vision Equipment and its Brazilian subsidiary, Attiva Visão e Imagen. Visit www.jai.com for specific contact information regarding JAI's worldwide sales channels.

NU HORIZONS ELECTRONICS

1stVision Inc.

integrys
A subsidiary of Allan Crawford Associates

JAI Japan - 20th anniversary

In March this year, JAI Ltd, Japan celebrated its 20th anniversary. JAI was established in March 1987 in Yokohama as Protech Japan Ltd, already at that time a leading industrial camera manufacturer.

JAI has office facilities in Yokohama near Tokyo and in Miyazaki, situated at the southernmost tip of Japan. During the past 20 years JAI Ltd, Japan has built a strong position not only in the Japanese market but also in the rest of the Asia Pacific region where JAI Ltd, Japan handles daily contact and support of JAI's distribution partners.

New JAI distributor in France

Elvitec, France has been appointed as the new JAI distributor for Camera Solutions. Founded in 2002, Elvitec specializes in distribution and integration of all the elements of vision technology.

Elvitec is active in all the classical segments of machine vision, as well as medical and high end security. The commercial focus of Elvitec is on OEMs, vision system integrators and volume end users. Elvitec's six person team is experienced in vision technology and looks forward to promoting and supporting the entire range of JAI cameras in France.

You can read more about Elvitec and its extensive product offerings on www.elvitec.fr

ELVITEC
ELEMENTS OF VISION TECHNOLOGY

CONDENSED CAMERA SELECTION GUIDE

Camera model	Resolution	Imager	Standard	Frame rate	Interface	Dimensions (mm)	Remarks
Monochrome Progressive Scan							
TM-4200 CL	2048 x 2048	1.2”	-	15 / 8*	CL	51 x 51 x 74	12-bit A/D. Pixel blemish compensation
TM-4200 GE	2048 x 2048	1.2”	-	15 / 8*	GigE	51 x 51 x 85	12-bit A/D. Pixel blemish compensation
TM-2030 CL	1920 x 1080	1”	HDTV	32 / 16*	CL	51 x 51 x 74	Replaces TM-2016. Pixel blemish comp.
TM-2030 GE	1920 x 1080	1”	HDTV	32 / 16*	GigE	51 x 51 x 85	Wide format with GigE output
CV-A20 CL	1920 x 1080	2/3”	HDTV	60	CL	35 x 44 x 58	CMOS, rolling (snap-shot) shutter
TM-2040 GE	1600 x 1200	1"	UXGA	34 / 17*	GigE	51 x 51 x 85	PIV mode. Pixel blemish compensation
CV-M2 CL	1600 x 1200	1"	UXGA	30 / 17 *	CL	40 x 50 x 120	2 tap. ITS and PIV functions
CM-200 MCL	1628 x 1236	1/1.8”	UXGA	25	Mini-CL	29 x 44 x 66	Compact digital 2 megapixel
TM-1325 CL	1392 x 1040	2/3"	SXGA	30 / 15*	CL	44 x 44 x 63	Near IR response
TM-1327 GE	1392 x 1040	2/3"	SXGA	30	GigE	51 x 51 x 85	Near IR enhanced
CV-M4+ CL	1392 x 1040	2/3”	SXGA	24	CL	40 x 50 x 90	Special ITS functions, Near IR
CM-140 MCL	1392 x 1040	1/2"	SXGA	31	Mini-CL	29 x 44 x 66	Compact digital 1.4 megapixel
TM-1402 CL	1392 x 1040	1/2"	SXGA	30 / 15*	CL	44 x 44 x 63	Cost-effective digital megapixel
TM-1405 GE	1392 x 1040	1/2”	SXGA	30	GigE	51 x 51 x 84	User-definable partial scanning
CV-A10 GE	782 x 582	1/2"	SVGA	60	GigE Vision	55 x 55 x 55	GPIO, Binning, partial scan
CV-A10 CL	782 x 582	1/2”	SVGA	60	CL	35 x 44 x 80	Double speed, auto shutter
TM-6760 CL	648 x 484	1/2”	VGA	60 / 30*	CL	44 x 44 x 63	No-delay shutter
TM-6740 CL	640 x 480	1/3"	VGA	200	CL	51 x 51 x 73	Partial scan & binning up to 2105 fps
TM-6740 GE	640 x 480	1/3”	VGA	200	GigE	51 x 51 x 85	Partial scan & binning up to 2105 fps
Color Progressive Scan							
TMC-4200 CL	2048 x 2048	1.2”	-	15/8*	CL	51 x 51 x 74	12-bit A/D. Pixel blemish compensation
TMC-4200 GE	2048 x 2048	1.2”	-	15/8*	GigE	51 x 51 x 85	12-bit A/D. Pixel blemish compensation
TMC-2030 CL	1920 x 1080	1”	HDTV	32 / 16*	CL	51 x 51 x 74	Wide format. Pixel blemish compensation
TMC-2030 GE	1920 x 1080	1”	HDTV	32 / 16*	GigE	51 x 51 x 85	Wide format with GigE output
CV-A80 MCL	1920 x 1080	2/3”	HDTV	60	CL	35 x 44 x 58	CMOS, rolling (snap-shot) shutter
TMC-2040 GE	1600 x 1200	1"	UXGA	34 / 17*	GigE	51 x 51 x 85	PIV mode, pixel blemish compensation
CV-M8 CL	1600 x 1200	1”	UXGA	30 / 17*	CL	40 x 50 x 120	2 tap. ITS functions
CB-200 MCL	1628 x 1236	1/1.8”	UXGA	25	Mini-CL	29 x 44 x 66	Compact digital 2 megapixel
CV-M7+ CL	1392 x 1040	2/3”	SXGA	24	CL	29 x 44 x 66	Special ITS functions
TMC-1325 CL	1392 x 1040	2/3”	SXGA	30/15*	CL	44 x 44 x 64	Near IR response
TMC-1327 GE	1392 x 1040	2/3”	SXGA	30	GigE	51 x 51 x 84	Near IR response
CB-140 MCL	1392 x 1040	1/2”	SXGA	31	Mini-CL	29 x 44 x 66	Compact digital 1.4 megapixel
TMC-1402 CL	1392 x 1040	1/2"	SXGA	30/15*	CL	44 x 44 x 64	Cost-effective digital megapixel
TMC-1405 GE	1392 x 1040	1/2"	SXGA	30	GigE	51 x 51 x 84	User-definable partial scanning
CV-M9 GE	1024 x 768	3 x 1/3”	XGA	30	GigE Vision	55 x 55 x 120	3CCD, RGB, shading correction
CV-M9 CL	1024 x 768	3 x 1/3”	XGA	30	CL	50 x 60 x 99	3CCD, RGB, shading correction
CV-A70 GE	782 x 582	1/2”	SVGA	60	GigE Vision	55 x 55 x 55	GPIO, sequencer, partial scan
CV-A70 CL	782 x 582	1/2”	SVGA	60	CL	35 x 44 x 80	Double speed, auto shutter
CV-M71 CL / A	782 x 582	1/2”	SVGA	60	CL / Analog	40 x 50 x 80	RGB out, Digital or analog
TMC-6760 CL	648 x 484	1/2”	VGA	60/30*	CL	44 x 44 x63	No-delay shutter
TMC-6740 CL	640 x 480	1/3”	VGA	200	CL	51 x 51 x 74	Color partial scanning up to 1250 fps
TMC-6740 GE	640 x 480	1/3”	VGA	200	GigE	51 x 51 x 85	Color partial scanning up to 1250 fps
Color 3CCD Line Scan							
CV-L107 CL	3 x 2048	28.7mm linear		Line rate 19 kHz	CL	90 x 90 x 90	Flat-field correction, CameraLink

**Selectable frame rate*

For complete information, please visit www.jai.com

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